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ABSTRACT

The educational discipline of Management is an inexact science. Because of the difficulty in measuring the effects of the academic study of Management on decision-making and related behaviors, a commercial instrument, the "How Supervise?" questionnaire, was tested as a possible means of measuring "before and after treatment" behaviors. The instrument, nominally a knowledge sampler, was used more as an attitude, perception, and potential behavior sampler. The subjects used in this study were the entire population of credit and non-credit students regularly enrolled in either of the two most basic Management Development courses offered at Manatee Junior College. Five groups of basic Management students were sampled; the total number of subjects was 65. Two equivalent forms of the instrument were administered on the first and last day of class. National percentile scores were grouped and histographically displayed; the composite results indicate that significant improvement in decision-making behaviors did occur in the individual groups as well as in the composite population. It is recommended that this type of measurement be pursued on a broader base to determine more about the effects of classroom environment, the student profile, and individual professors on positive change in student attitudes and behaviors. (Author/AH)

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DECISION-MAKING BEHAVIORAL CHANGE IN STUDENTS CONNECTED WITH THEIR PARTICIPATION IN A FIRST THEORETICAL MANAGEMENT COURSE

by

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Manatee Junior College

A PRACTICUM PRESENTED TO NOVA UNIVERSITY
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE
DEGREE OF DOCTOR OF EDUCATION

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JC 750 119

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STATEMENT OF THE QUESTION

GENERAL

When students take courses in a formalized school setting it is nearly always intended by the system that the students' intellectual understandings and accumulations of information will occur; at least in the case of successful students.

This problem hinges on whether or not the formal system described above also affects decision-making behavior of the student/participator.

SPECIFIC

Does a student/participator in a first theoretical management course change his behavior and decision-making values after having accumulated (or at least been exposed to) "new" intellectual information and a cross section of ideas and opinions regarding this information.

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THE HYPOTHESES

I. NULL HYPOTHESIS

There is no difference in students' decision-making behavior before and after having participated in a "first course" in Management Theory and Principles. In other words: $H_o: \mu_{\text{pre-test}} = \mu_{\text{post-test}}$

OR

$$H_o: \mu_D = 0$$

I. ALTERNATIVE HYPOTHESIS

There is a discrete improvement in students' decision-making behavior, before and after having participated in a "first course" in Management Theory and Principles. In other words:

$$H_1: \mu_{\text{pre-test}} < \mu_{\text{post-test}}$$

OR

$$H_o: \mu_D > 0$$

BACKGROUND AND SIGNIFICANCE OF THE STUDY

When Management professors teach a "first" course in Management Theory and Principles there should always be the question in their minds: "Have I helped make any positive significant contributions to the lives of my students?"

Hopefully this question would be asked overtly and consciously by all teachers in all disciplines. But it will only be considered here as a latent question in the minds of Junior College Management professors.

These professors of Management (and others engaged in Management and supervisory development) have little difficulty in measuring their students' retention of facts, statements of principle, and vocabulary. This sort of thing is usually done by using conventional testing methods and comparing the students' results to some arbitrary and variable set of standards.

On the other hand, concerned and conscientious Management Development professionals really want to know.

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whether their students are using their "new" information in decision making and related behaviors. When the student is removed from the classroom and "thrown" back into the world of operational choosing, is he better prepared to do this by virtue of his formal schooling? Can the student function in society's best interests more effectively after formal system education?

Do exposure to or accumulation and examination of facts, principles and vocabulary help a person to mature in such important individual characteristics as "Management Mindedness",[1] insight, empathy, objectivity, decisiveness, and so forth? Most Management disciplinarians (both academic and operative) sternly hope so, particularly in light of educational costs, but they are rarely certain.

There is a great deal of evidence to show that the basic values, attitudes and beliefs of individuals control their decision making behavior to a large

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[1]Boyd, Bradford, Management-Minded Supervision (Wisconsin, 1968).

extent. In fact, the truths and realities are often completely ignored in favor of feelings.[2]

We are therefore, as teachers, prompted to ask ourselves, "Do these students really change their values, attitudes and perceptions about Managerial and Organizational society once they have studied the academics involved?" "Are their cognitive powers greater after exposure to these things and does this, in turn, influence their feelings about things?"[3]

Since most Management Development professionals rarely have an opportunity to follow up on their students' progress, they have few legitimate sources of feedback on their own "performance" as behavioral modifiers. The rule of thumb in Management Development

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[2]Likert, Rensis, New Patterns of Management (Michigan, 1961), page 199; and Maier, Norman R. F., Industrial Psychology (Michigan, 1955).

[3]Simon, Sydney B., Howe, L. W., and Kirschbaum, H., Values Clarification: A Handbook of Practical Strategies for Teachers and Students (New York, 1972).

seems to be: "Take students as they come,

educate them formally,

encourage those who really catch fire,

and hope for the best."

The writer believes there are more positive ways of measuring propensity for behavioral change in the students of beginning management.[4]

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[4]Buros, Oscar Krisen, The Seventh Mental Measurements Yearbook, Volume I (New Jersey, 1972).

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DEFINITION OF TERMS

I. The Discipline of Management: A body of knowledge, largely empirical, which describes and discusses management as a combination of social science, real science, philosophy, logic and art. It defines a manager as one who plans, directs, organizes, staffs, co-ordinates and controls and generally achieves primarily through the efforts of his subordinates.[5]

II. Decision-Making: Choosing from among the available alternatives.[6]

III. Decision-Making Behavior: The intellectual and emotional processes each individual uses in Decision-Making, based on his personal values.[7]

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[5]Koontz, Harold and O'Donnel, Cyril, Principles of Management: An Analysis of Managerial Functions (New York 1972).

[6]Maier, Industrial Psychology.

[7]Likert, New Patterns of Management.

IV. Values: The fundamental base of learned understandings and worth from which individuals perceive any specific situation and judge it in terms of good, bad, right, wrong, or anywhere in between.

V. An Enterprise: Any organized, purposeful undertaking.[8]

VI. A Beginning Management Course: One which assumes its students are ignorant of the discipline and, with this base, explores the history, universality, rationale, and basic functions of managers. Such a course also relates many principles and concepts empirically found useful by most enlightened practitioners of Management in various enterprises.

VII. Beginning Management Student: One who enrolls in a beginning management course (no assumption about prior enlightenment or experience in the field).

VIII. Management Educator: One engaged in the specific occupation of teaching people the discipline of Management as it is now understood.

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[8]Koontz and O'Donnel, Principles of Management: An Analysis of Managerial Functions.

LIMITATIONS OF THIS STUDY

I. A limited population of Management students was studied in a single institution under the tutorage of a single instructor.

II. No pre-test of Management theory, principles or vocabulary was used in this study. Therefore, it was impossible to attempt any correlation between changes in learned theoretical knowledge and changes in decision-making behavior over the period of the course for the students tested.

III. No attempt was made, in any way, to try to correlate the students' earned grades in the beginning Management course to his scores on the decision-making behavior measurements.

IV. Individual student biases in experimental measurements probably exist based on differences of individual perceptions as to the reason(s) for and importance of the measurements. Nevertheless,

all experimental subjects were completely informed about the instrument, who designed it, how it is used in national enterprise, and the purpose for measuring them. Specifically, it was made clear that the results of the experimental testing would have absolutely no bearing on the grade for the course.

V. Inter-Group biases will exist due to the composite factors (age, experiences, socio-economic factors, etc.) which prevail in different groups. The students tested were not "homogeneous" in group characteristics,

VI. Because of the limited number of subjects available over the period, it was decided to measure the entire population (n= 65), rather than do randomized selection of the subjects.

BASIC ASSUMPTIONS

It is assumed, for the purpose of this study, that:

I. Learnings from the discipline of Management, properly applied, can help individuals function more effectively and efficiently in our society of Enterprise.

II. Management educators wish to have a beneficial and broadening effect on individuals and society through their teaching efforts.

III. That better enterprise management leads toward improved quality of life in society.[9]

IV. That basic educational test and measurement techniques lend themselves to measuring a management student's retention and understanding of facts, principles and vocabulary.

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[9]Barnard, C., The Function of the Executive (Cambridge, Massachusetts, 1938).

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V. That, even though a student can demonstrate his intellectual mastery of the management discipline, there is no guarantee that he will make operational use of his learned skills in the real world.[10]

VI. Effective management performance relies heavily on the individual practitioner's insight and judgement. This fact precludes the possibility of ever being exactly certain as to exactly what ought to be done in any given circumstance. Therefore, taught procedural and rote memorizations have but limited use in the practice of management.

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[10]Likert, New Patterns of Management.

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PROCEDURES FOR COLLECTING DATA

POPULATION SELECTION

The subjects used in this study were the entire population of credit and non-credit students regularly enrolled in both of the two most basic Management Development courses offered at Manatee Junior College.

Some of the subjects were full-time freshman and sophomore students working toward an Associate or baccalaureate degree. Some of the students were part-time students (from age seventeen through age fifty) who work full or part-time in the community. Some of the students were veterans of the military service and some were retirees. The ratio of male to female overall was 2.8 : 1. At least seven ethnic distinctions existed in the population.

It was estimated (by past experience and unpublished surveys of the writer) that eighty percent of the subjects had already had some enterprise employment

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experience and, of those, nearly ten percent had some supervisory experience.

It was found that most students were taking their management course as a degree requirement, an elective, or as a means of self-development in their current careers. A few were just taking the courses out of curiosity or "for fun".

Ninety-four percent of the population studied were career or work oriented people with reasonably well defined career objectives (to become an engineer, a lawyer, a building contractor, a minister, etc.).

DETAILS OF DATA COLLECTION

The Psychology Corporation questionnaire "HOW SUPERVISE?" was administered to all described subjects on the first day of their first formal management course at the college. This was done before any of the subject matter of the course was broached.

The students were fully oriented verbally as to how and why this questionnaire came to be, who used it and for what in the world of American and foreign

enterprise. These subjects were further advised that, by completing the questionnaire in class, they would be participating in curricula research. They were finally advised that their personal results would have absolutely no bearing on their course progress (grades) and that the scores (and meanings) would be given them at the completion. of the course.

On the next-to-last day of the course, all remaining students were again asked to complete an equivalent questionnaire, published by the same corporation. The two equivalent tests (pre- and post-) were scored and the results were returned to the students along with a discussion of national norms published by the psychological corporation.

FIXING THE POPULATION

Data from pre-test subjects who were not available for the post-test were dropped. Data from post-tests which had no pre-test counterpart scores were dropped. Paired scores were kept intact mechanically.

The final raw data were in four separate groups

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of varying size with $n_1 = 12$, $n_2 = 15$, $n_3 = 23$, and $n_4 = 16$, respectively. The total number of subjects (N_{total}) was 65.

TREATMENT OF THE DATA

Refining the Data

All experimental data was translated from raw scores into percentile scores, using the national percentile norms based on the scores obtained by 1,082 operating supervisors in companies of various sizes and natures.[11] These percentile scores were then used to display, examine and test the data.

Displaying the Data

The distribution of pre-test and post-test percentile scores was displayed for each group individually as well as for the composite group. (See Exhibit I, Histograms of group and composite scores.)

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[11] File, Q. W. and Remmers, H. H., Manual on "HOW SUPERVISE?" (1971).

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Data Characteristics

Central tendency and Dispersion characteristics for each group were calculated both for pre-test and for post-test data. (See Exhibit II, Sample Calculation and Calculated data.)

Significance Testing

Individual Group and Composite (Population) data was tested for significant "before and after" change in the positive direction (one-tailed test), using the "Direct-Difference t-test for paired data".[12]

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[12] Dixon, W. J. and Massey, F. J., Introduction to Statistical Analysis (Michigan, 1957), page 126; and Runyan, R. P. and Haber, A., Fundamentals of Behavioral Statistics, (New Jersey, 1968), page 169.

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RESULTS

INTRODUCTION

The included Tables and Charts depict all raw data, Normalized data (national percentile equivalents), and calculated statistics for the population as well as for the individual sub-groups, Group 1 through Group 4.

Also included in this section are pre-test and post-test histograms for the composite population as well as for each sub-group. These histograms are all on the same scales, so that weightedness, central and modal tendencies, and dispersion characteristics may be more easily seen.

RESULTS

HISTOGRAPHIC ANALYSIS OF POPULATION AND SUB-GROUPS

All Histograms in this section of the report are displayed on the same scale for visual comparative purposes. The data arrays were grouped into ten-percentile increments for ease of presentation. It was felt that finer division of the data would be of little benefit.

A single calculated* frequency distribution chart for all individual groups as well as the composite (population) group precedes the histograms.

Each histogram shows the placement of each group in the national percentile rankings.

*These calculations are not shown.

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EXHIBIT I

Histograms of Group and Composite Scores, Including a Calculated Frequency Distribution Chart

CALCULATED FREQUENCY DISTRIBUTION CHART

Class Includes %tile rankings Of	GROUP 1 Frequency of Grouped %tile Scores		GROUP 2 Grouped %tile Scores		GROUP 3 Grouped %tile Scores		GROUP 4 Grouped %tile Scores		COMPOSITE POPULATION GROUPED %TILE SCORES	
	f_{11}	f_{12}	f_{21}	f_{22}	f_{31}	f_{32}	f_{41}	f_{42}	f_{51}	f_{52}
0-9	0	0	1	1	1	0	0	0	2	1
10-19	0	0	1	0	0	1	0	0	1	1
20-29	1	0	0	0	1	0	0	0	2	0
30-39	0	0	0	1	1	0	0	0	1	1
40-49	1	0	0	0	2	1	2	2	5	3
50-59	1	1	1	0	5	2	1	0	8	3
60-69	1	3	4	1	2	4	3	1	10	9
70-79	3	1	1	2	2	6	4	1	10	10
80-89	2	2	2	1	6	4	2	3	12	10
90-99	3	5	6	10	2	4	3	8	14	27
	n_1	12	n_2	16	r_3	22	n_4	15	n_5	65

NOTE: See "Appendix on Symbols".

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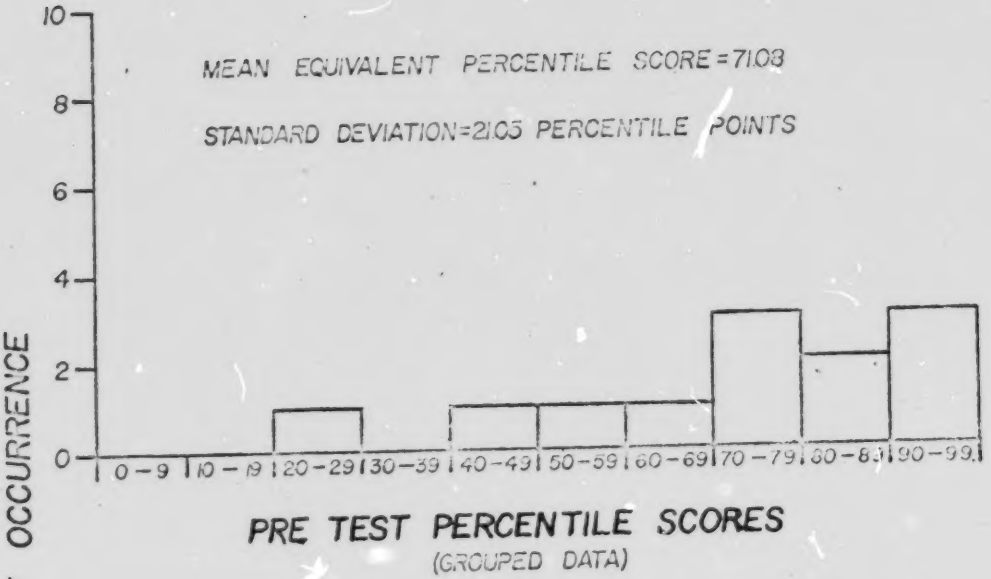
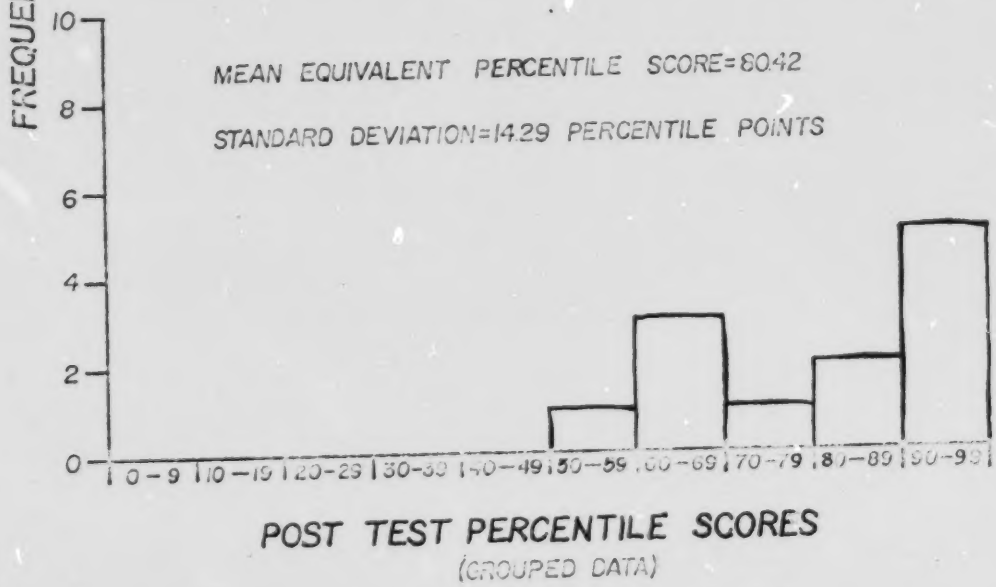
PERCENTILE SCORES
FOR
"HOW SUPERVISE"
BEFORE AND AFTER
TREATMENT
PREPARED BY: T. BADLEY
DATE: 20 AUGUST, 1974

HISTOGRAM FOR GROUP I (N=12)





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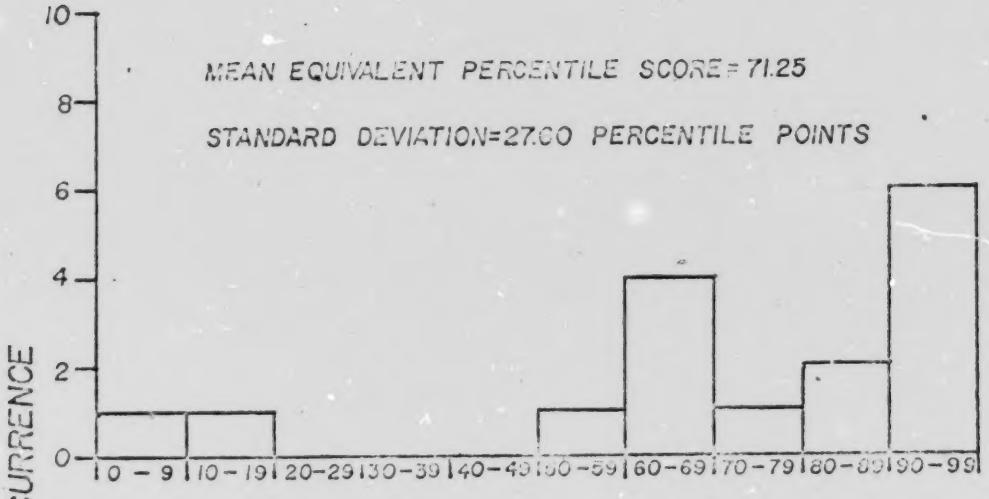
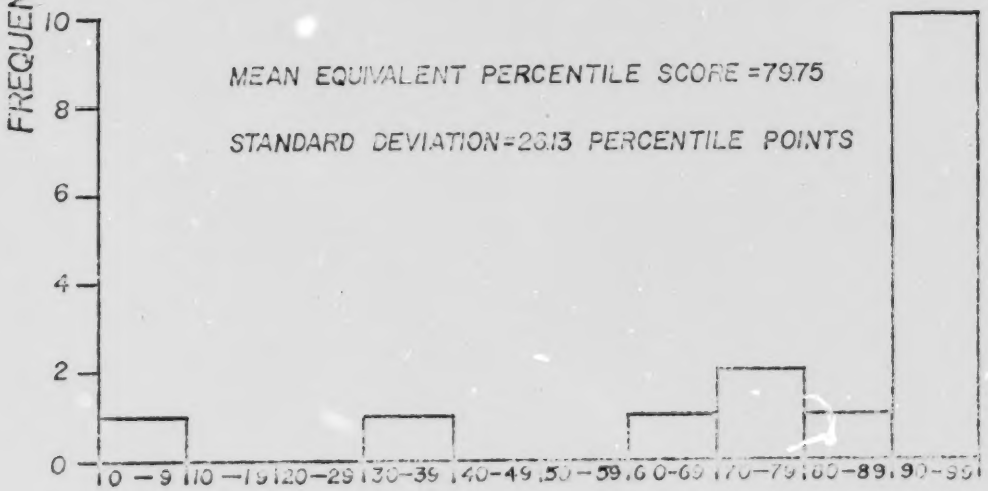
PERCENTILE SCORES
FOR
"NON SUPERVISE"
BEFORE AND AFTER
TREATMENT
PREPARED BY: T. DADLEY
DATE: 20 AUGUST, 1974

HISTOGRAM FOR GROUP 2 (N=16)





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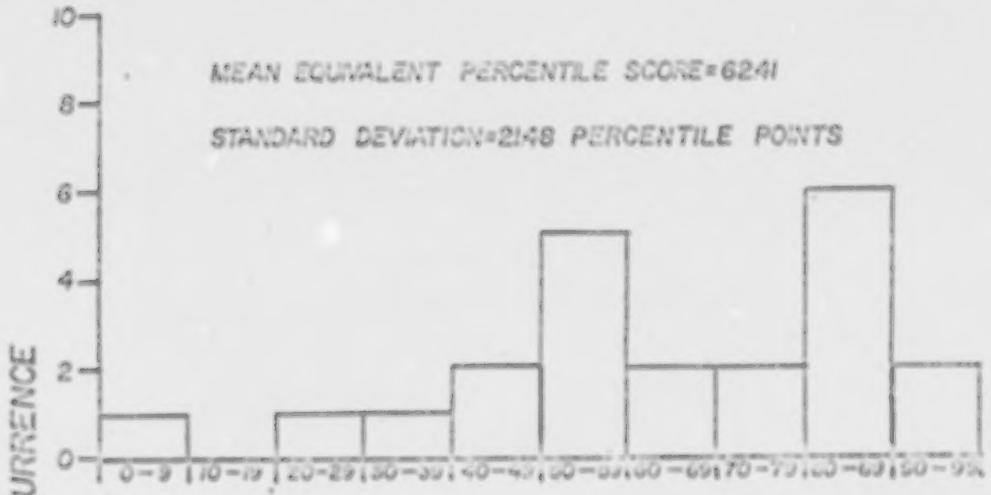
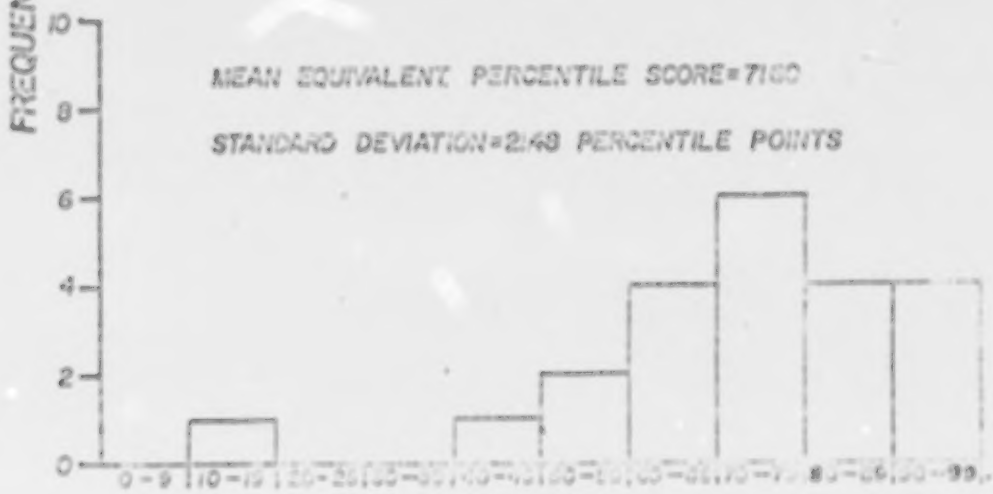
PERCENTILE SCORES
FOR
[illegible]
BEFORE AND AFTER
TREATMENT
PREPARED BY T. CADLEY
DATE: 20 AUGUST, 1974

HISTOGRAM FOR GROUP 3 (N=22)



PRE TEST PERCENTILE SCORES
(GROUPED DATA)



POST TEST PERCENTILE SCORES
(GROUPED DATA)

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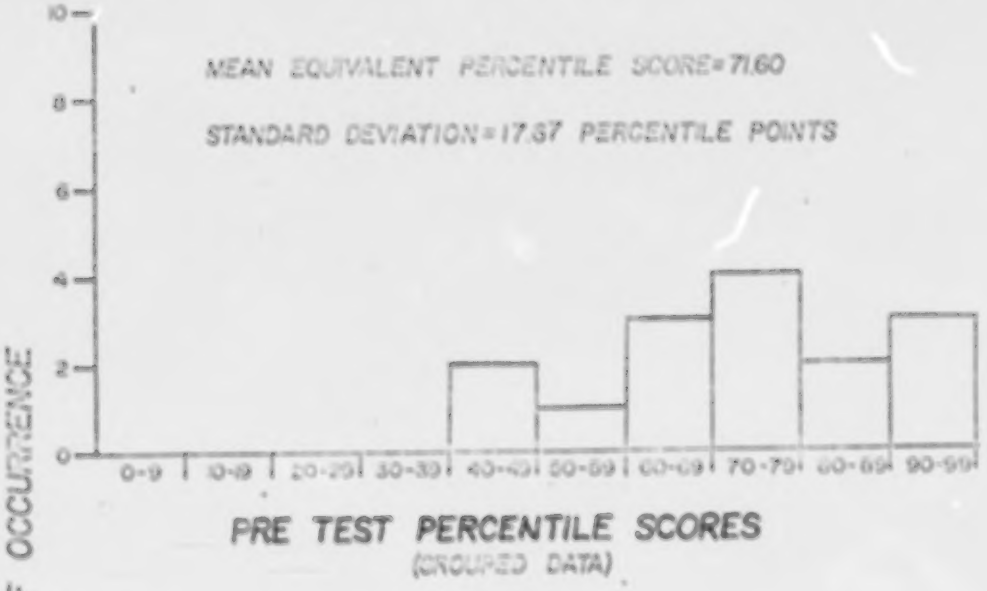
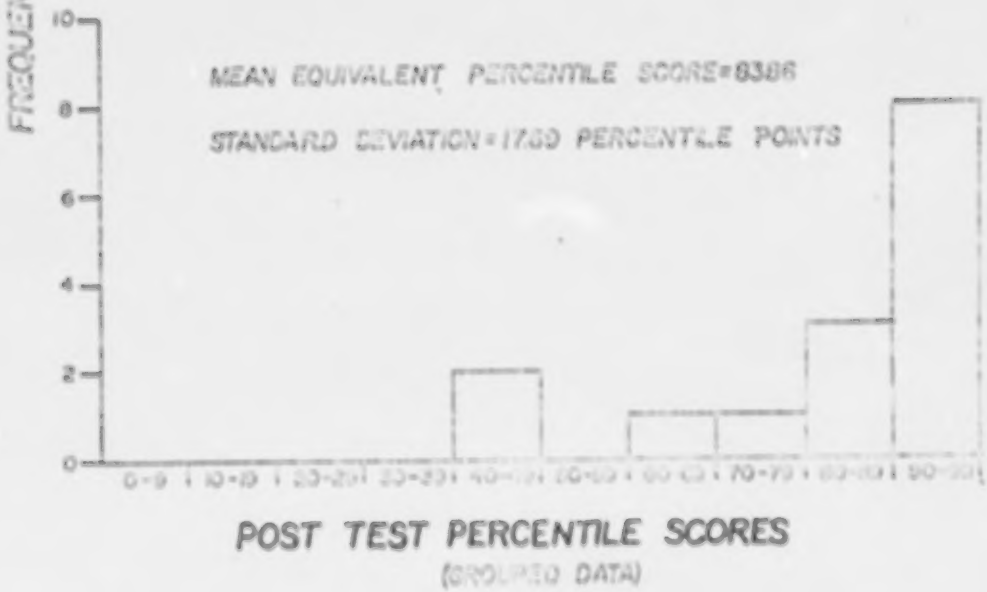
PERCENTILE SCORES
"[illegible]"
BY [illegible]
PREPARED BY T. RADLEY
DATE: 20 AUGUST, 1974

Histograms for Group 4 (n=15)



PRE TEST PERCENTILE SCORES
(GROUPED DATA)



POST TEST PERCENTILE SCORES
(GROUPED DATA)

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COMPOSITE PRE TEST HISTOGRAM (N=65)

STUDENT PERCENTILE SCORES

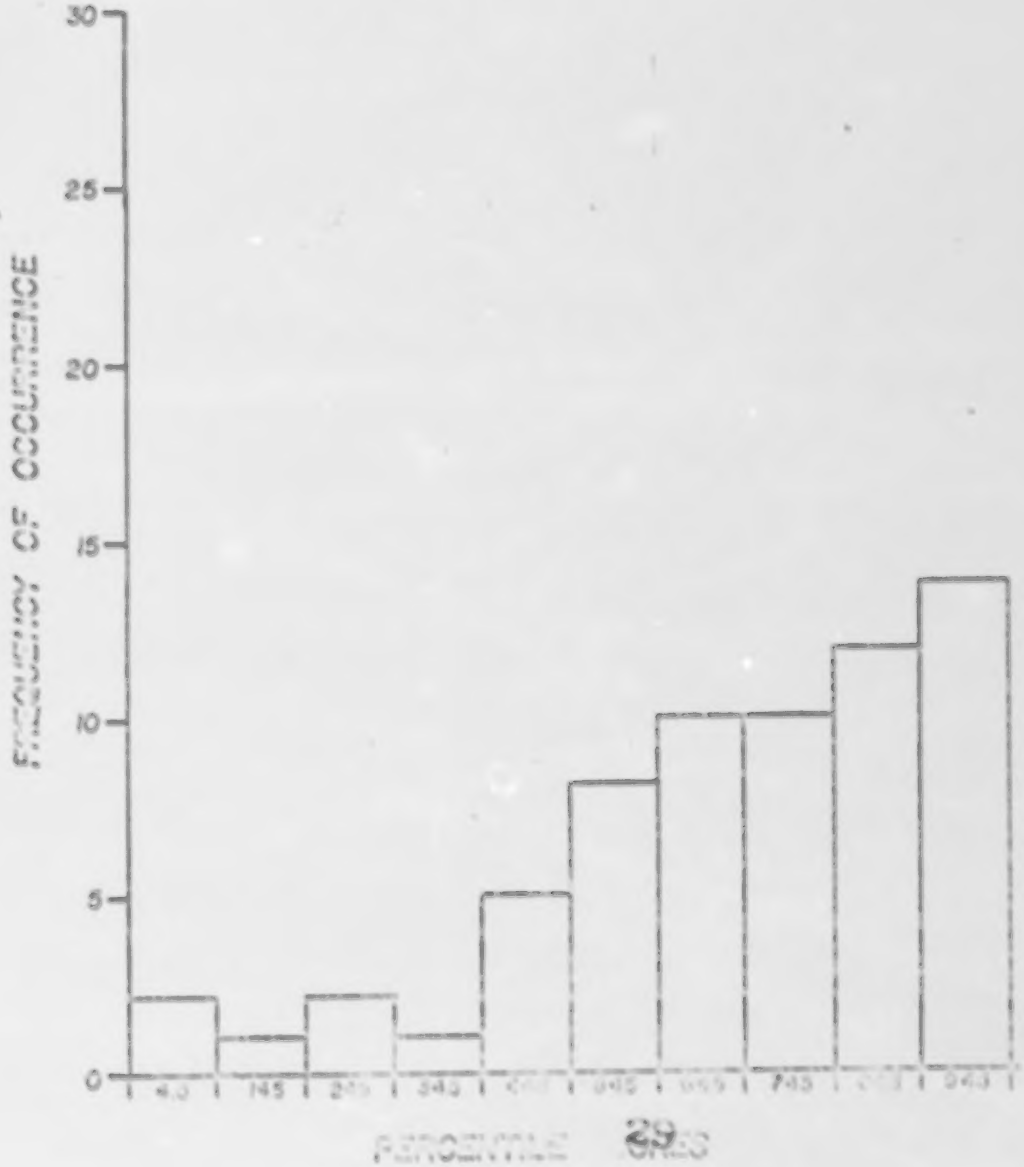
FOR

"HOW SUPERVISE"

BEFORE TREATMENT

PREPARED BY: T. BADLEY.

DATE: 20 AUGUST, 1974



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COMPOSITE POST TEST HISTOGRAM (N=65)

STUDENT PERCENTILE SCORES

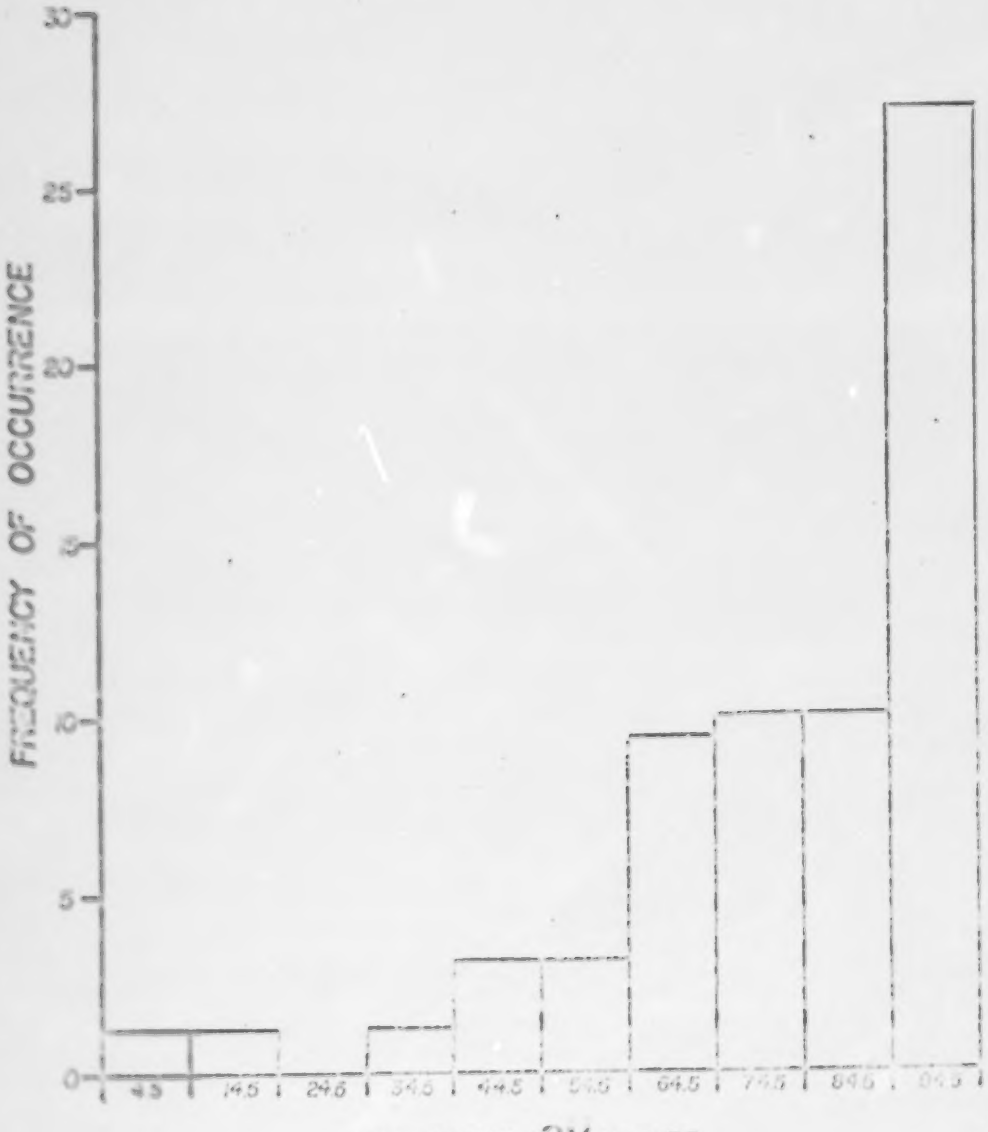
FOR

"HOW SUPERVISE"

AFTER TREATMENT

PREPARED BY: T. BADLEY

DATE: 20 AUGUST, 1974



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RESULTS

DIRECT-DIFFERENCE OF THE COMPOSITE GROUP SCORES

GENERAL

This analysis technique was chosen because of its simplicity and also because the statistical parameters of the normalized national scores were not available at the time of the experiment. The "before and after" design of the experiment also lent itself to this treatment very nicely.

THE HYPOTHESES

As previously stated, the null hypothesis (H_o: $\mu_D = 0$) was that no significant change in students' attitudes and values about management would occur by virtue of their exposure to facts, principles, and concepts of management in a classroom situation. The alternative hypothesis (H_1: $\mu_D = 0$) was that an expected "improvement" in managerial attitudes and values would occur by virtue of this exposure. Please

note that the alternative hypothesis is directional (positive direction) and consequently a one-tailed test was employed.

THE STATISTICAL TEST

The statistical test considered appropriate was the Student t - ratio for correlated samples (in view of "before - after" design): $t = \frac{\bar{D}}{Se}$

SIGNIFICANCE LEVEL

The significance level chosen is $\alpha = .01$

CALCULATIONS

The calculations of the statistics are shown on tables immediately following.

EXHIBIT II

Sample Calculations and Calculated Data

COMPOSITE

DIRECT DIFFERENCE t-RATIO

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CALCULATIONS FOR THE COMPOSITE GROUP

GROUP	DATA		
	n_i	D_i	D_i^2
1	12	112	4,790
2	16	136	12,800
3	22	202	5,598
4	15	184	7,866

$\Sigma n_i = N = 65$ $\quad \Sigma D_i = \Sigma D = 634$ $\quad \Sigma D_i^2 = \Sigma D^2 = 31,054$

$N = 65$

$(N - 1) = 64$

$\Sigma D_i = 634$

$(\Sigma D_i)^2 = 401,956$

$\Sigma D_i^2 = 31,054$

$\bar{D} = +9.75$

$$S^2 = \left(\frac{N \Sigma D^2 - (\Sigma D)^2}{N(N - 1)} \right)$$

$$= \underline{\underline{388.59}}$$

$$Se = \frac{\sqrt{S^2}}{\sqrt{N}} = 2.45$$

$$t = \frac{\bar{D}}{Se} = 3.98$$

$df = 64$

Significant at .0001 level

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TABLE I

DIRECT DIFFERENCE t-RATIO CALCULATION

FOR GROUP I

SUBJECT	BEFORE X_{11}	AFTER X_{12}	DIFFERENCE D_1	$(D_1)^2$
1	77	87	10	100
2	55	82	27	729
3	62	62	0	0
4	82	67	-15	225
5	22	57	35	1225
6	92	92	0	0
7	99	99	0	0
8	45	93	48	2304
9	90	97	7	49
10	77	70	-7	49
11	82	92	10	100
12	70	67	-3	9
			ΣD 112	ΣD^2 4790

$n_1 = 12$

$\Sigma D_1 = 11$

$(\Sigma D_1)^2 = 112$

$\Sigma D_1^2 = 4790$

$\bar{D}_1 = 9.33$

$$s_1^2 = \left(\frac{n_1 \Sigma D_1^2 - (\Sigma D_1)^2}{n_1(n_1 - 1)} \right) = 340.42$$

$$s_1 = \sqrt{s_1^2} = 18.45$$

Standard Error or the Mean:

$$Se_1 = \frac{S_1}{\sqrt{n^1}} = 5.33$$

$$t_1 = \frac{\bar{D}_1}{Se_1} = \frac{1.75}{}$$

35

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GROUP 2

SUBJECT	BEFORE X_{21}	AFTER X_{22}	DIFFERENCE D_2	D_2^2
1	85	99	14	196
2	65	91	26	676
3	65	33	-32	1024
4	92	94	2	4
5	56	94	38	1444
6	93	94	1	1
7	0	4	4	16
8	62	85	23	529
9	93	70	-23	529
10	94	60	-34	1156
11	17	99	82	6724
12	99	99	0	0
13	97	99	2	4
14	86	90	4	16
15	65	74	9	81
16	71	91	20	400
			$\Sigma D_2 = 136$	$\Sigma D_2^2 = 12,800$

$(n_2 = 16)$

$n_2 = 16$

$df = 15$

$\Sigma D_2 = 136$

$(\Sigma D_2)^2 = 18,496$

$\Sigma D_2^2 = 12,800$

$\bar{D}_2 = 8.5$

$$S_2 = \sqrt{\frac{n_2 \Sigma D_2^2 - (\Sigma D_2)^2}{n_2(n_2 - 1)}} = 27.86$$

$$Se_2 = \left(\frac{S_2}{\sqrt{n_2}} \right) = 7.19$$

$$t_2 = \left(\frac{\bar{D}_2}{Se_2} \right) = 1.18$$

Significance between 10 and 20% at 15 df

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GROUP 3

SUBJECT	BEFORE X_{31}	AFTER X_{32}	DIFFERENCE D_3	D_3^2
1	22	65	43	1,849
2	35	40	5	25
3	60	70	10	100
4	45	72	27	729
5	81	92	11	121
6	55	85	30	900
7	9	16	7	49
8	80	70	-10	100
9	80	77	-3	9
10	75	98	23	529
11	81	75	-6	36
12	55	57	2	4
13	55	65	10	100
14	55	65	10	100
15	47	50	3	9
16	80	80	0	0
17	90	92	2	4
18	60	60	0	0
19	57	85	28	784
20	87	97	10	100
21	72	77	5	25
22	92	87	-5	25
			$\Sigma D_3 = 202$	$\Sigma D_3^2 = 5,598$

$n_3 = 22$

$n_3 = 22$

degrees of freedom = 21

$\Sigma D_3 = 202$

$(\Sigma D_3)^2 = 40,804$

$\Sigma D_3^2 = 5,598$

$\bar{D}_3 = 9.18$

$$S_3 = \sqrt{\frac{n_3 \Sigma D_3^2 - (\Sigma D_3)^2}{n_3(n_3 - 1)}} = 13.35$$

$$Se_3 = \left(\frac{S_3}{\sqrt{n_3}}\right) = 2.85$$

$$t_3 = \frac{\bar{D}_3}{Se} = 3.22$$

Significant at .001 level with 21 degrees of freedom

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GROUP 4

SUBJECT	BEFORE X_{41}	AFTER X_{42}	DIFFERENCE D_4	D_4^2
1	62	85	23	529
2	45	65	20	400
3	62	47	-15	225
4	82	82	0	0
5	82	72	-10	100
6	60	47	-13	169
7	99	99	0	0
8	99	99	0	0
9	70	99	29	841
10	99	99	0	0
11	70	92	22	484
12	55	92	37	1369
13	77	95	18	324
14	42	98	56	3136
15	70	87	17	289
$n_4 = 15$	$\bar{X}_{41} = 71.6$	$\bar{X}_{42} = 83.8$	$\Sigma D_4 = 184$	$\Sigma D_4^2 = 7866$

$n_4 = 15$

$df = 14$

$\Sigma D_4 = 184$

$(\Sigma D_4)^2 = 33,856$

$\Sigma D_4^2 = 7,866$

$\bar{D}_4 = 12.27$

$$S_4 = \sqrt{\frac{n_4 \Sigma D_4^2 - (\Sigma D_4)^2}{n_4(n_4 - 1)}}$$

$S_4 = 20.0$

$$Se_4 = \frac{S_4}{\sqrt{n_4}} = 5.17$$

$$t_4 = \frac{\bar{D}_4}{Se_4} = 2.37$$

CONCLUSIONS AND SIGNIFICANCE

The Direct-Difference "t" test performed on the composite group (population) before-and-after scores showed a highly significant improvement in decision-making behavior of the students after taking the course as opposed to before taking the course. Specifically:

A) The null hypothesis (H_o: $\mu_D = 0$) is summarily <u>rejected</u> at $t_\alpha = .01$ with 64 degrees of freedom.

B) The alternate hypothesis (H_1: $\mu_D > 0$) is <u>accepted</u> at $t_\alpha = .01$ with 64 degrees of freedom.

Actually, the t statistic calculated for the composite group showed positive change at about the .0001 level of significance with 64 degrees of freedom. This is very strong evidence that these students came out of the course with changed behavior in a "good" direction.

The significance of this conclusion is obvious. The teacher is having an influence and is certainly on the right track. But, more important, he should be careful to measure his results in this fashion continually in order to keep track of his own progress (management by objectives technique). Changes in curriculum, format, technique, environment, student profile, textbooks, media and so forth might cause changes in his success. We would hope that any changes which occur would be progressive rather than regressive.

Further significance lies in the realm of other management teachers being able to measure their results in the same fashion in their institutions and thereby determining whether or not they are having the influence they desire.

RESIDUAL FINDINGS

AMOUNT OF EXPERIMENTAL CHANGE DUE TO ATTITUDE CHANGE

This researcher finds it totally impossible to measure or even speculate on how much experimental change can be attributed to cognition and how much to emotion (value standards, feelings, perceptions and the like) from this instrument! We have really measured an empirical result!

Likert (1961) pointed out that the decision-making process involves both cognitive and motivational forces. Not only that, but the inputs, outputs and feedback loops involved in such a process or system of this sort are really complex. To confound the problem even more, there is considerable (and unmeasurable) interaction between the cognitive and motivational forces. They are not independent.

The significance here cautions us to credit the

pure informational learning with some of the cognitive behavioral change. In other words, accumulation of facts, principles, and theories may very well lead to some behavioral change.

EXPERIMENTAL DISTRIBUTION

The distribution of experimental scores was heavily skewed to the left (negative skew), both on pre-test and post-test results. The subjects of this experiment did not fit the national norms used, as can readily be seen in the histograms. This anomaly arrested the author and caused a search of the literature for similar anomalies. Apparently the before and after application of "HOW SUPERVISE?" in a formal college management education program has not been investigated; or, at least, evidence of identical research has not been discovered yet.

Since the experimental subjects were heterogeneous in profile, it was the author's election to use national

norms of "first-line, operating supervisors in various industries" as a basis for comparison[13] even though the original norms were established over twenty years ago. This thought gave rise to the question of validity of the norms, of course, because of rapidly changing standards, values and mores in recent years.[14]

But File and Remmers also had more recent norms (1971) (with smaller sample size) which on cursory inspection, would give the same skewed appearance to the experimental results had the norms been used instead.

The speculation made after considering this matter was that perhaps the objectives or motivations of a "formal" management student differ from those of operating supervisors or from students of other disciplines (Psychology, for example) where this instrument has been experimentally tested.

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[13] File and Remmers, "HOW SUPERVISE?"

[14] Toffler, A., Future Shock

RECOMMENDATIONS AND ACTIONS

I. It is suggested (and agreed upon) that this experimental process will be one of the tools used in the pilot institution by all professors to objectively measure the success trends of the Management Theory course on a continuing basis.

II. It has further been suggested (and agreed upon) that in-house research (at no cost) be continued to try to find similar commercial instruments of merit to measure behavioral change effectiveness in other similar courses.

III. RoKeach's "Study of Human Values" will be specifically and similarly tested in a managerial "Human Relations" course at the institution within the calendar year.[15]

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[15] RoKeach, Milton, A Study of Human Values (Detroit, 1973).

IV. It is recommended that this instrument undergo normalization in a college-level Management Theory test bed (preferably in several types, sizes and locations of schools simultaneously) to reduce the skewness of results as normalized in a "foreign" population.

V. Changes in the "first" management course format, syllabus, media, text, and decisive student profile at the institution would warrant complete replication of the experiment. This will help to make sure as to the quality of the change or changes toward the benefit of the student.

APPENDIX ON SYMBOLS USED

The following pages identify and describe the symbols used to identify, organize and label data which was measured or calculated during the course of this study.

Symbolism

The following general symbolism was used to handle the data (pairing was done mechanically to reduce the number of subscripts):

r_{ij}: The raw score included in the i^{th} group and the j^{th} replication (j can only equal 1 or 2 depending on whether it is pre-test or post-test data, respectively).

x_{ij}: The equivalent percentile score for each r.

$\overline{x}_{ij}$: The arithmetic mean of the x_{ij} data.

σ_{ij}: The standard deviation of percentile points for the x_{ij} data.

n_{ij}: The "sample" size or size of the group tested.

$\overline{X}$: Composite (population) arithmetic mean of percentile scores.

N: Composite (population) total number of subjects tested.

D_i: The differences between the matched post-test percentile and the pre-test percentile (post-test minus pre-test) x_{ij} data: $D_i \quad (x_{12} - x_{11})$

$\overline{D_i}$: The arithmetic mean of the D_i data.

$S_{\overline{D}i}$: The standard deviation of the D_i data:

$$S_{\overline{D}i} = \sqrt{\frac{n_i \quad D_i^2 - (\quad D_i)^2}{n_i \ (n_i - 1)}}$$

Se_i: The standard error of the mean for the D_i data:

$$Se_i = \frac{S_{\overline{D}i}}{\sqrt{n_i}}$$

t_i: The "Student's 't'" statistic calculated from the D_i data: $t_i = \frac{\overline{D_i}}{Se_i}$

α: The level of significance.

df: The number of degrees of freedom used for a given "t" test: $df_i = (n_i - 1)$

OR

$$df = (N - 1)$$

f_{ij}: The frequency of occurrence in grouped data.

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